



**-- Clients --**

## IMPRESSED CURRENT ANTI FOULING



## **Corrosion & Water-Control b.v.**

***P.O. Box 47  
NL-2750 AA Moerkapelle  
The Netherlands***

***Tel. (+31) 79 - 5931295***

***Fax: (+31) 79 - 5931871***

***Website :***

***[www.corrosion.nl](http://www.corrosion.nl)***

***General email :***

***[info@corrosion.nl](mailto:info@corrosion.nl)***

***Service email :***

***[service@corrosion.nl](mailto:service@corrosion.nl)***



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# 1 Introduction

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## 1.A Remarks

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 ***Read this instruction manual before proceeding.***

Please note that on request of Corrosion & Water-Control bv, or one of it's official world-wide agents, the installation of ICAF system can be inspected prior to the first use. Please check with Corrosion & Water-Control bv for more information regarding the commissioning.

## 1.B Guarantee and Liability

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The "General conditions" of Corrosion & Water-Control bv are applicable here. Please also refer to the confirmation of the order for possible additions.

Improper functioning not covered by the guarantee as a result of:

- Incorrect installation;
- Not following the instructions in this manual;
- Replacement with non-original parts.

## 1.C Environment

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- The environmental laws and rules of the area where the ICAF system is installed, always have to be respected and observed;
- The rules of the classification societies – if applicable – have to be respected and observed;
- Always be cautious of dangerous voltages.

## 1.D Safety

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Pay attention:









Touching some parts of the system may result in hazardous voltage shocks.

The secondary voltage of the anodes (1 - 12 VDC) and current (0 - 40 A) used in this ICAF system is at such a low level, that it is not hazardous for humans.

However the primary voltage in the power supply can be hazardous to humans: installation and maintenance should only be done with the main power disconnected and by knowledgeable and authorised personnel only.

## 1.E Instruction symbols

---

	path to menu or function
	function description
	Tip
	Attention/note
	for more/further information
	know before go!
	Menu activation bar (upper bar)
	Function dependable menu activation bar (lower bar)

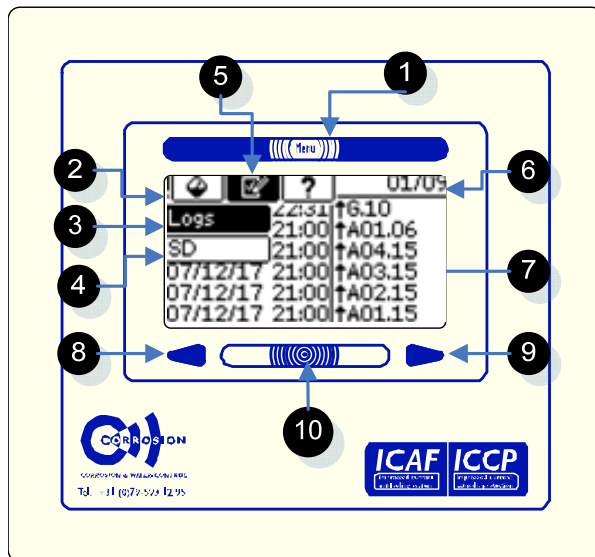
## 1.F Terms and abbreviations

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System	Complete ICAF system
DPU	Digital processing unit
ACP CARD	Modular connection card
Restart	Unpower the system completely and power up again
normally open	State of contacts when de-energized
PS	Port side
SB	Starboard

## User interface

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- (1) : Main menu bar; toggles between main menu and current screen;
- (2) : Main menu;
- (3) : submenu (if applicable);
- (4) : current or chosen position in the submenu;
- (5) : current or chosen position in the main menu;
- (6) : Title bar, current page/unit, total available pages/unit's;
- (7) : display with chosen options or relevant information;
- (8) : page/unit back;
- (9) : page/unit forward;
- (10) : The lower bar toggles an extra function, if applicable.

## 1.G Navigation

---

- Touch the menu bar (1) to display the (main)menu bar shown on upper side on the LCD screen;
- Touch the menu bar (1) again to hide the menu (toggle function) or choose a tab (2);
- If there are no sub menu's it will lead directly to the related menu (7);
- If more sub menu's exist, then these will be displayed at the left side on the LCD screen (3);
- Choose a sub menu item (3).

👉 ***If the LCD backlight is not activated (sleep mode), the first random touch at the screen will lit the backlight.***

👉 ***The current location in the menu is recognizable by the inverted (dark) tabs when menu is displayed (4 & 5).***

## 1.H Changing parameters

---

```
< Settings UI/Settings >
Status          On
Setpoint I      01.10 A
Setpoint II      00.80 A
Polarity level   0.3 V
Pause interval   Off
```

- Select a parameter value displayed on the screen
- A keypad (left) or a chose panel (right) will appear (current value is displayed)
- Enter a new value (left) **or** Select with "<" or ">" the proper function (right)



- confirm the new setting (enter) or escape (esc)
- Enter or escape will return to the previous menu

👉 ***Before changing the sign (+/-), first enter the digit's;***

👉 ***Use the delete (←) to erase the last digit or the escape (esc) to go back without changing the parameter.***

## 1.1 Accessing parameters

---

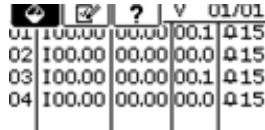
  (?), (logon) or (Logout)”

The operation of this ICAF unit is categorized into three different USER levels:

Level 0: read-out only, no system adjustments can be made -  
(Accessible for everyone);

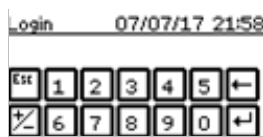
Level 1: primary functions; to access this level a pin code is needed –  
(Ships engineers);

If system adjustments must be made, a pin code is required to access the specific menu.






	01	02	03	04
01	100.00	00.00	00.1	015
02	100.00	00.00	00.0	015
03	100.00	00.00	00.1	015
04	100.00	00.00	00.0	015

First touch the (?) then “login”, the keypad will appear

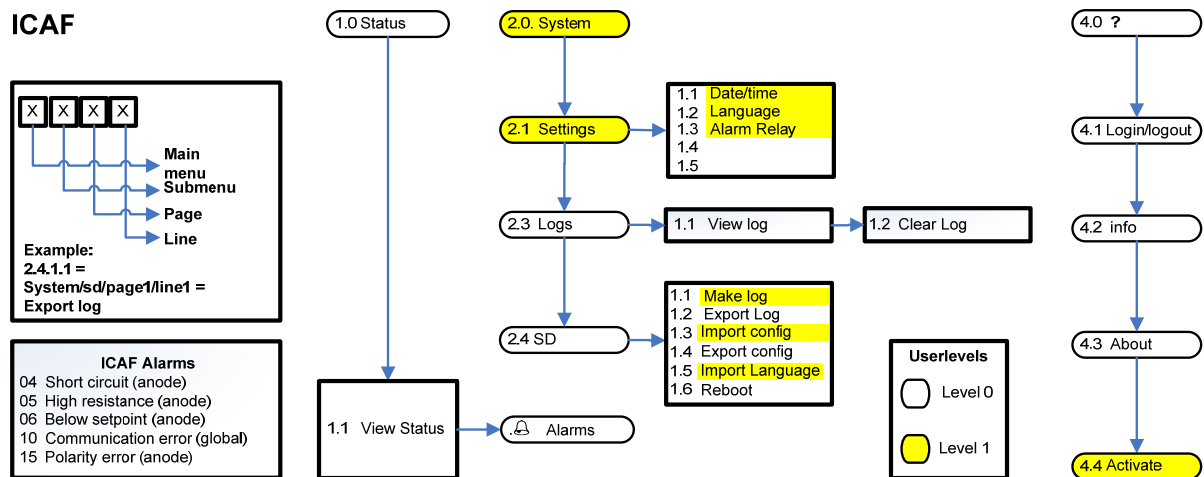


Enter the correct pin code followed by enter:

**Default pin code for level 1 = 1234 (PIN code can be changed);**

-  **Only when the correct password is entered, the advanced function tabs will appear;**
-  **After 15 minutes of no activity on the touch screen, the system will automatically log off;**
-  **To excess other levels, first log out, then repeat login.**

## 1.J Menu flow diagram



## 1.K Main menu tabs



The main menu consists of the following items, displayed with tabs:

1. (Status) Status displays and sets the anode values;
2. (System) General system settings;
3. (Hardware) Hardware configuration;
4. (?) Logon/log off, product & customer information.

**Use the backward and forward arrows to select the unit in the status screen.**

**1.0.1.0) Menu Status.**

## 1.L Menu overview

M	S	P	L	(English)	Unit	Min	Max	Default	Lv	Remark
1	0	1	0	Status display	UNIT	1	7	1	0	Overview screen per unit
1	0	1	1	Alarms	NA	NA	NA	NA	0	Overview of alarms
1	1	1	1	status	select	On	OFF	On	1	
2	0	0	0	systemsettings						
2	1	1	1	Date/time	date	YY/MM/DD	HH:MM	n/a	1	
2	1	1	2	Language	select	EN	EN	EN	1	import other language from sd card
2	1	1	3	Alarm relays	select	Error ON	Error OFF	Error OFF	1	
2	3	0	0	Logs	NA	NA	NA	NA	0	Displays most recent alarms /event logs (max.100)
2	3	1	1	View log	NA	NA	NA	NA	0	
2	3	1	2	Clear log	NA	NA	NA	NA	0	
3	4	0	0	SD					0	SD card import/export, log- and system dump
3	4	1	1	Make log	NA	NA	NA	NA	1	Makes current situation log and collect it on the SD-card
3	4	1	2	Export log	NA	NA	NA	NA	0	Copies the complete event/alarm log on the SD-card
3	4	1	3	Import configuration	NA	NA	NA	NA	1	Imports all settings from the SD-card
3	4	1	4	Export configuration	NA	NA	NA	NA	0	Copies all settings on the SD-card
3	4	1	5	Import Language	NA	NA	NA	NA	1	Imports a language file from the SD-card
3	4	1	6	Reboot	NA	NA	NA	NA	0	Reboot the system to reset or update
4	0	0	0	Information (?)						
4	1	1	0	Login/Logout	num	1	999999999	level 0	0	
4	2	1	0	Info	info	NA	NA	NA	0	
4	3	1	0	About	info	NA	NA	NA	0	
4	4	1	0	Activation	num	NA	NA	NA	1	

## 2 Principle of the ICAF system

---

ICAF is an abbreviation of Impressed Current Anti Fouling. It's basic function is to prevent biological marine growth in cooling systems.

Barnacles, mussels, algae, and other types of shellfish grow in the cooling system and thus adversely affect it's functioning. Vessels operating in coastal water run the greatest risk of being polluted by fouling.

This very reliable and sophisticated ICAF system is a highly effective option to prevent this kind of fouling.

It's functional principle is based on an artificially triggered voltage difference between the copper anodes and a suitable cathode. This causes a minor electric current to flow from the anodes, so that they are dissolved to a certain degree.

The control unit of this ICAF system (The Digital Processing Unit), offers a number of control functions to make sure that the anodes add the required minimum amount of copper particles to the sea water. This process ensures the formation of copper (I) oxide and creates ambient conditions to prevent fouling from nesting inside the cooling systems.

In some cases aluminium or iron anodes are used beside the copper anodes. The function of those aluminium and iron anodes is to avoid corrosion damage in the connected/related pipe work.

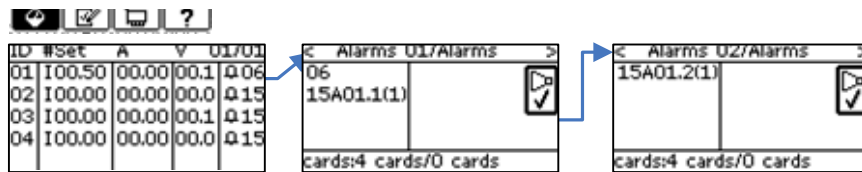
This ICAF system can interact with the ship's management system to show alarms and current values. The ICAF system can also interact with sea water pumps.

Therefore, perfect protection is guaranteed under all conditions and the amount of dissolved copper is minimised to prolong the lifetime of the anodes.

## 3 Status menu

### 1.0.0.0) Status

panel overview

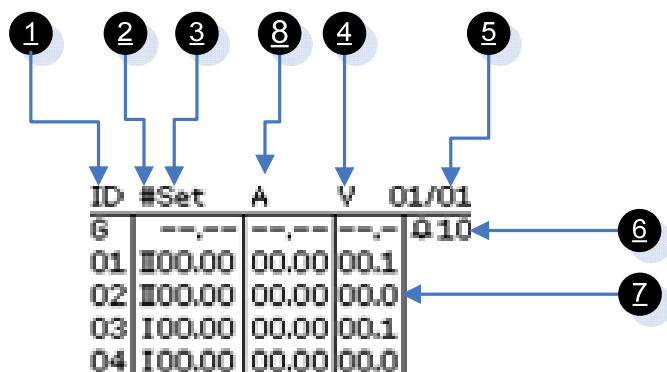


The following screen will appear when the system is operating properly and no alarms are active.



### 1.0.1.0) Status panel

(((menu))) (status)



- (1) **ID** : anode number
- (2) **#** : setpoint number (I or II)
- (3) **Set** : current setpoint or status (e.g. Off, Pause)
- (4) **V** : actual anode voltage measured in volts.
- (5) **01/01** : page x of xx pages, Alternating with indicates a **new** alarm. selecting the alarm bells will navigate to an extended information panel.
- (6) **Alarm** : alarm column shows active alarms per anode:  
Codes: = alarm indicator, 15 = error code.  
 *Alarms & alarm settings*
- (7) **line** : select the appropriate anode to navigate to the anode settings panel.  
 *1.0.1.0) Anode settings*
- (8) **A** : actual anode power measured in amps.

**Use the backward and forward arrows to navigate through the panels.**

## 4 Menu system/settings

---

### 2.1.0.0) Settings

---

Display overview

	<b>System/Settings</b>	<b>01/01</b>
<b>Settings</b>	2.1.1.1 Date/time	19:32:39
<b>Alarms</b>	2.1.1.2 Language	EN
<b>Logs</b>	2.1.1.3 Alarm relays	Error OFF
<b>SD</b>		

👉 **General system parameters are applicable for all the anodes or the complete system.**

#### 2.1.1.1) Date/time

---

📁 (Settings), "Date/time"  
✂ adjustment of date and time

👉 **Attention:**  
**The timestamp of previous made logs will not be changed.**

👉 **Standard time is set according to UTC.**

#### 2.1.1.2) Language

---

📁 (Settings), "Language"  
✂ change interface language

**English** = Default  
**2<sup>nd</sup> language** = import from sd card

👉 **Default:**  
**Only English language available.**

👉 **Special languages on request.**

📖 **SD Card**

#### 2.1.1.3) Alarm relays

---

📁 (Settings), "Alarm relais"  
✂ select energized or de-energized relays in case of alarm.

**Error on** = energized while alarm is active  
**Error off** = de-energized while alarm is active

👉 **Setting applies for both relays (2x).**

📖 **Alarms & alarm settings.**



## 5 Menu system/Log

---

### 2.3.0.0) Logs

---

Display overview

		V	U1/U1	07/12/17 22:26	04/09	07/12/17 22:25	01/09	<div>Clear log?</div> <div>No</div> <div>Esc</div> <div>◀</div> <div>▶</div> <div>↩</div>
Settings	00.00	00.1		07/12/15 14:18	↓A04.06	07/12/17 21:00	↑A01.06	
Logs	00.00	00.0		07/12/15 14:18	↓A04.05	07/12/17 21:00	↑A04.15	
SD	00.00	00.1		07/12/15 14:07	↑A04.06	07/12/17 21:00	↑A03.15	
	00.00	00.0		07/12/15 14:06	↓A04.05	07/12/17 21:00	↑A02.15	

07/12/15 14:06	↓A04.05	07/12/17 21:00	↑A01.15
07/12/15 14:06	↓A04.05	07/12/17 20:59	Startuo

### 2.3.1.0) events & alarm logs

---

  (Logs)

✂ displays the last 100 alarms and events (starts with most recent log)

👉 **Use the backward and forward key to navigate through the pages for additional log info, copy the log to the SD card (2.4.1.0-SD card) and use the log viewer.**

👉 **An overview is generated, for extended log info. Copy the log to the SD card and use the log viewer.**

👉 **Touch the (lower) menu bar to clear the log.**

## 6 Menu System/SD

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### 2.4.0.0) SD

---

Display overview



#### 2.4.1.1) Make a system log instantly (level 1)

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📁 (((menu))) (SD), "make log"

✂ touching the button will make a log instantly

👉 **The log is saved to the internal memory. Use 2.4.1.2) export log to export copy a for export to SD card.**

👉 **When inserting a SD-card, the SD main menu will automatically be displayed.**

#### 2.4.1.2) Export log

---

📁 (((menu))) (SD), "export log"

✂ export the internal log files on SD card

👉 **Filename is the "serial number" of the DPU unit with "CWL" extension, e.g. 1234.cwl.**

👉 **Exporting the log will NOT clear de log. It's only a copy!**

👉 **If no SD card is found, the message "please insert SD-card" will be displayed.**

👉 **When inserting a SD-card, the SD main menu will automatically be displayed.**

#### 2.4.1.3) Import a configuration file (level 1)

---

📁 (((menu))) (Unit), (SD), "Import cnf."

✂ Import a configuration file from SD card with settings (serial number.

👉 **Insert an SD card containing the correct configuration file. This files should consist a name equal with the serial number of the DPU and have a .CWS extension**


👉 **Be sure that SD card contains not an update file (AT1440.alf)**

👉 **After successful import of the file, the system will reboot automatically**

- 👉 ***If no SD card is found, the message “please insert SD-card” will appear.***
- 👉 ***When inserting a SD-card, the SD main menu will automatically appear.***
- 👉 ***The log will be cleared after importing new settings!***

#### **2.4.1.4) Export a configuration file**

---


📁  (Unit), (SD), “Export cnf.”

✂ export (copy) all the settings and configuration parameters of the system on a SD card

- 👉 ***Filename is the “serial number” of the DPU unit with “CWS” extension, e.g. 1234.cws.***
- 👉 ***If no SD card is found, the message “please insert SD-card” will appear.***
- 👉 ***When inserting a SD-card, the SD main menu will automatically appear.***

#### **2.4.1.5) Import second language file (level 1)**

---


📁  (Unit), (SD), “Import lng”

✂ Import a predefined language file from SD to the DPU

- 👉 ***Insert an SD card containing the correct language file. This file should consist of a name equal to the serial number of the DPU and have a .cwt extension.***
- 👉 ***After successful import of the file, the system will switch to the second language automatically.***
- 👉 ***If no SD card is found, the message “please insert SD-card” will appear.***
- 👉 ***When inserting a SD-card, the SD main menu will automatically appear.***

#### **2.4.1.6) Reboot**

---

📁  (Unit), (SD), “Reboot”

✂ reboot the system without the need to power down

- 👉 ***This option can also be used to trigger an update while system is powered: Slide the SD card (containing a newer version file) into the slot, the SD functions will popup and choose reboot.***
- 👉 ***It is strongly recommended to export configurations before making any updates.***

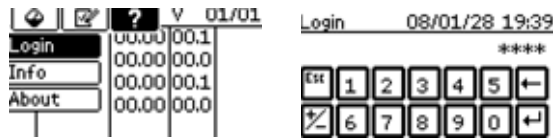
## 7 Menu (?)/Login

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### 4.1.0.0) Login/log off

---

Display overview



### 4.1.1.0) Login/log off

---

(((menu))) (?), (login) of (Logout)"

✂ Login to excess level specific functions

- 👉 ***After 15 minutes of no activity on the touch screen, the system will automatically log off (level 0);***
- 👉 ***To excess other levels, first log out, then repeat login;***
- 👉 ***Default pin code for level 1 = 1234;***




## 8 Menu (?)/Info

---




### 4.1.2.0) Info

---

Display overview "Level 0"



			V	01/01	Info	01/01
Login	00.00	00.1			Type	CWControl LCD
Info	00.00	00.1			Snr.	0000001234
About	00.00	00.1			Sys. code	C182F554
	00.00	00.0			Version	#969 X
					Date/time	15:01:34

Display overview "Level 1"

			V	01/01	Info	01/01
Logout	00.00	00.1			Type	CWControl LCD
Info	00.00	00.0			Snr.	0000001234
About	00.00	00.1			Sys. code	C182F554
Activate	00.00	00.0			Version	#969 X
					Date/time	15:01:34

### 4.1.2.0) Info

---

  ( ? ), ( Info )

✖ Serial number & version information

## 9 Menu (?) / About

---

Display overview "Level 0"

	?	Y	U1/U1	About	U1/U1
Login	00.00	00.1		Reference no.	
Info	00.00	00.0		Yard no.	
About	00.00	00.1		Systemtype	
	00.00	00.0		Type of powerunit	

Display overview "Level 1"

	?	Y	U1/U1	About	U1/U1
Logout	00.00	00.1		Reference no.	
Info	00.00	00.0		Yard no.	
About	00.00	00.1		Systemtype	
Activate	00.00	00.0		Type of powerunit	

### 4.1.3.0) About

---

(((menu))) (?) , (about)


✂ customer & system information

## 10 Menu (?)/Activation

The system is carefully designed to guarantee its function between two dry-dock periods, with almost no maintenance. The lifetime of the anodes is based on the information given by the shipyard or ship owner. The almost complete dissolved anodes should be changed during a dry-dock period, with original spare anodes only.

After commissioning the ICAF system should be activated with a special key, which can be obtained by internet. The expire date of this code is equal to a dry-dock period (lifetime of the anodes), plus a safety margin.

Before expiration, the system will generate a pre-alarm and show the remaining lifetime of the anodes, thus before maintenance is required.

Alarms/All 01/01  
Activation warn.   
Cur. act.:  
31d (~1.0M)  
Time left:  
31d (~1.0M)

The set point of this pre-alarm is set to assure plenty of time to schedule maintenance and arrange the necessary original (spare) parts.

The system will repeat the pre-alarm a few times.

After installation of the original anodes, the system should be activated again with a special code, which can be obtained by internet.

To avoid any damage on the vessel, the system will shut down completely.

To **view** the remaining period or to **enter** a new activation key:

- login to level 1;
- Proceed to the activation menu;
- The screen shows the original period (current activation time) and the remaining time;

Logout	00.00	00.1
Info	00.00	00.0
About	00.00	00.1
Activate	00.00	00.0

Activation	01/01
Snr.	0000001234
Sys. code	C182F554
Cur. act.	Infinite
Time left	Infinite
Enter activation key	

Enter activation key											
0	1	2	3	4	A	B	C				
5	6	7	8	9	D	E	F				

- To obtain an activation code, note the serial number of the DPU (Snr.) and the system code (Sys.code);
- Visit the website of Corrosion & Water Control bv ([www.corrosion.nl](http://www.corrosion.nl)), to fill in above mentioned numbers to obtain the **activation key**;
- Touch the "enter activation key" and enter the new activation key;
- The system is now activated and ready to use.

👉 **Attention; A locked DPU can only be unlocked with a valid activation key!**

👉 **After entering a new activation code, the remaining time will be overruled. The new entered period will start immediately.**

When the system is activated you are able to make use of our worldwide service network. All service engineers have easy access to all relevant details of the system when activated, so fast and determined action can be taken when required. With this feature we try to reduce the installation of non-original parts, which can affect the function of our system.

# 11 Understanding the software

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## DPU

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The DPU (digital processor unit) consist of a LCD display provided with a touch screen and a microprocessor controller.

The DPU is capable to control 16 ICAF cards, which offers 64 individual controlled 1,1Amp (@10 volt) outputs.

The DPU is also provided with 4 configurable inputs. These inputs control the current of the specific anodes between the lower or higher setpoint. This can be used to extend the lifetime.

The DPU can be installed in the ICAF cabinet or separate (e.g. control room).

The DPU can be installed in one of the unit cabinets or separate (e.g. control room).

## Anode settings

---

The following settings can be made for every anode:

### **Status**

on/off = to activated or de-activated the specific anode.

### **setpoints**

Setpoint I = The normally required power in amps.

Setpoint II = Used when High/Low function is activated.

## *Switching setpoints.*

### **Polarity level**


Every time the primary voltage is reconnected the system will check the potentials of all anodes (in unpowered state)

Copper anodes have a typical expected potential of +300mV. A value -300mV indicates that the anode is wrong connected, while a value of +100mV indicates that the anode material is not copper. In these cases the system will generate an alarm and prevent the activation of this anode to avoid any damage.

When the installation is corrected, a restart of the system will activate the specific anode(s) again.

## Output configuration

---

Every available channel delivers maximal 1,1 amps @ 10volts. It can be used as a single anode. When more power (Amp) is required, more channels can be combined to one anode in order the reach the required power. ( *installation manual*). The channels should be appointed to the specific anode (output).

## 12 Understanding the software

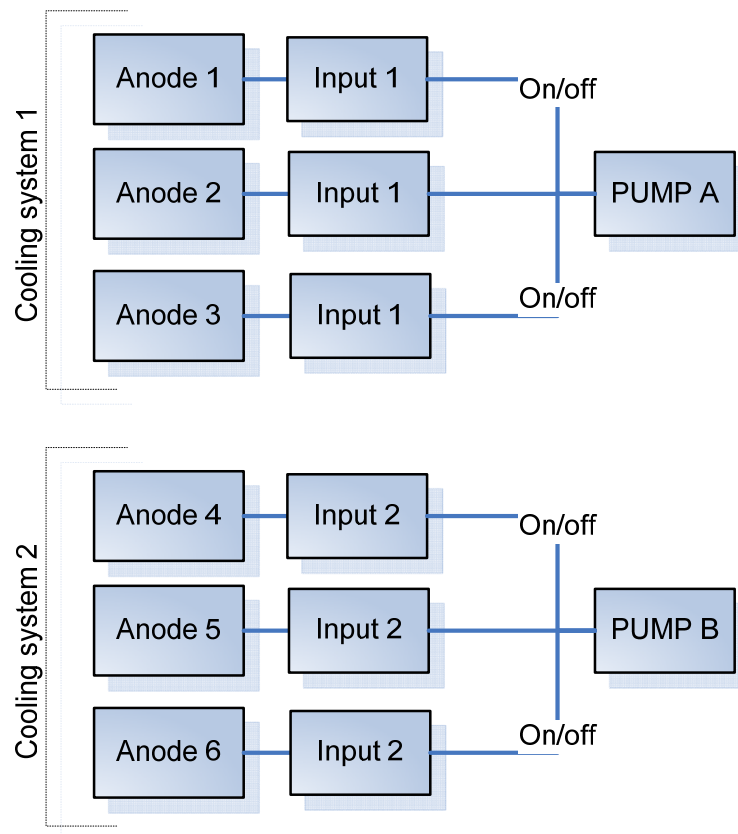
### switching setpoints

The system is provided with a second setpoint parameter per anode. This feature can be very useful when the water intake fluctuates strongly in volume. For instance, use the first setpoint for normal operation and the second (lower) setpoint in cases of minor volume water consumption. This feature assures a minimum use of power and extend the lifetime of the anodes.

Switching between the setpoints is utilized by four inputs. Each input can be configured to one or more anodes. Connect the input to a remote switch or better; to a potential free contact which indicates that the concerning system (pump) on or off to regulate automatically switching between the setpoints.

 **To connect the input to a (remote) device**  **installation manual.**

Example illustration



## Alarms & alarm settings

---

The ICAF system can compromise extensive monitor & alarming features.

The alarm monitor is divided in two parts:

1. Monitoring the performance of the system, e.g. communication, correct outputs and inputs signals.
2. Exceeding of set limits, e.g. amps, resistance, etc.

 ***The ICAF system has enough space to log at least 15000 alarms and events in its memory.***

If an alarm is activated the following actions will take place:

1. the alarm code will be displayed;
2. the system will log the alarm, with all relevant information;
3. the alarm relays will be activated.

 ***An alarm should be acknowledged.***

All the alarms (except system errors) are individual provided with

- adjustable upper and/or lower limit's
- on/off (or set to "0") when the specific options is not used

## alarm codes

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The log screen displays the last 100 alarm records, sorted by date with the most recent on top.

All lines starts with a timestamp followed by a code. The code represents the following information:

Example : 07/12/31 13:48 | ↑A01.09

<b>07/12/31 13:48</b>	Time stamp	YY/MM/DD UU:MM
	separator	
<b>↑</b>	start/end alarm	↑ = start alarm ↓ = end alarm
<b>A</b>	source of alarm	A = Anode G = general
<b>01</b>	unit number	only in case of unit
<b>09</b>	alarm code	see table alarm code

### Table alarm code

Code	Error/Warning	A/G	Description
04	Short circuit	(Anode)	Check anode cable and/or anodes constructions
05	High resistance	(Anode)	Warn out anode(s) or open circuit(s)
06	Below setpoint	(Anode)	Output failure or to high resistance
10	Communication error	(global)	Communication problem between DPU and one or more cards
15	Polarity error	(Anode)	Wrong polarity. Connection or improper type anode

The system includes two double poled relays for respectively alarm notification to third party equipment and indication of the system status.

Both relays will be activated whenever an alarm occurs. The first relay will be de-activated **after** acknowledgement, while the second relay stays active as long as the alarm situation remains.

The function **2.1.1.3) alarm relays** provides the choice whether, the relays should be energized (normally de-energized) or vice versa. Together with both normally open or closed hardware connections available, a variety of function can be made, depended on the requirement.

While an alarm is not (yet) acknowledged, the first relays will stay active. In order to be notified of other alarms.

☞ ***“normally open” and “normally closed” contacts are in perspective of a de-energized relays.***

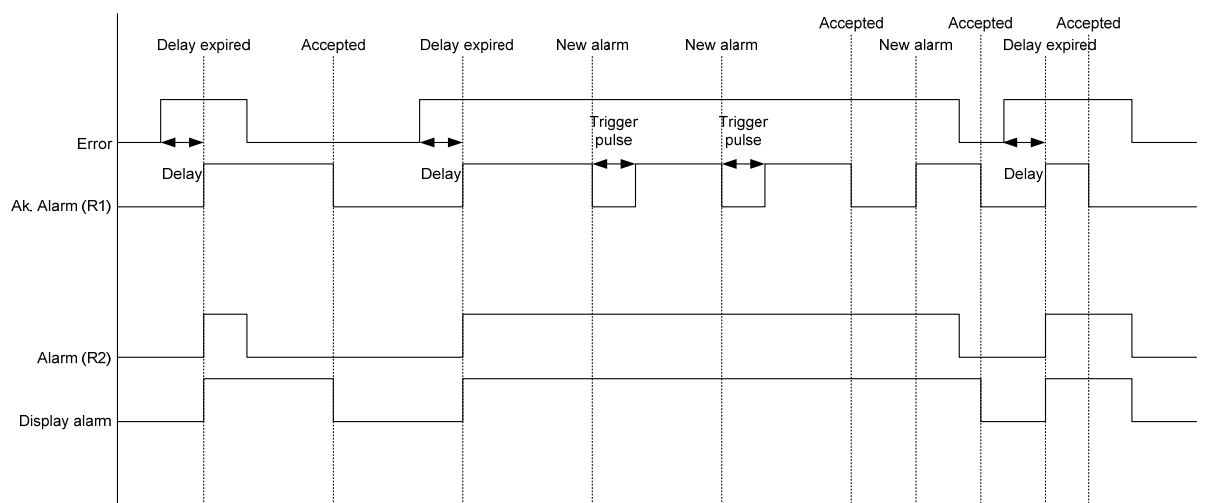
The recommended connection is a de-energized relays connected to the normally open contacts. In order to have a “fail safe” alarm which will set the alarm in case of power interruption or broken wires.

Functions of the alarm relays:

### 2.1.1.3) alarm relays

Defines energized or de-energized relays function during alarm.

☞ ***For a complete understanding of the alarm behaviour, we refer to the following schematic overview;***



## Event & alarm logging

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The DPU is equipped with an internal flash memory, which offers space for 15000 alarms, events or data logs.

The internal flash mechanism works on FI-FO (First In - First Out). After complete filling of the memory the oldest log will be replaced by a new one.

There are 4 types of logs:

1. Data logs : general daily log of the performance of the ICAF system;
2. Alarm logs : error code including time stamp and source of the alarm;
3. System log : system dump of current hard and software situation, especially for debug hard & software purposes;
4. Event logs : to monitor changes at the system like startup.

 ***The last 100 alarm logs (including startup event log) can be displayed in the display provided with timestamp.***

 ***Clearing the alarms in the display will not delete the logs in the flash memory.***

 ***To copy logs onto a SD card***


## SD Card

## SD Card

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The back of the DPU is provided with a SD-card slot.

The SD card is used for update the system and import/export data from and into the system.

 ***The SD card must be formatted with a 6 byte fat system. This can be achieved by any computer with a Windows™ operating system with a SD card slot.***

### Import/export data

When sliding a SD Card in the slot, *while the system is powered*, the DPU will automatically detect the presents and trigger the SD card menu (2.4.0.0)


This menu shows the following options:

- Make log : instantly make a system dump (internal memory!)
- Export Log : copies the TOTAL log (including a system dump) on SD card.
- Import language : import a second language from sd card (future option)

### Update the ICCP

To update the ICCP system;

- Copy the update file (xxx.alf file) on to the SD card.
- be sure the system is unpowered.
- Slide the SD card into the slot
- Power the system
- The screen shows the status of the update import and will start automatically after finishing the update. (don't interrupt this process!)
- Check the settings and adjust were needed.

 ***Attention :***  
***In case of new release with additional functions, parameters and configurations will be set as factory defaults. Be sure to have a backup of all the settings and configurations and the knowledge to adjust these.***